
स्वचल वाहन —
स्थिर वाहनों से उत्पन्न शोर — मापन पद्धति
(दूसरा पुनरीक्षण)

Automotive Vehicles —
Noise Emitted by Stationary
Vehicles — Method of Measurement
(Second Revision)

ICS 17.140.30

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Automotive Braking and Steering Systems, Vehicles Testing and Performance Evaluation Sectional Committee had been approved by the Transport Engineering Division Council.

This standard was first published in 1982 and was revised in 1998. This second revision is being published to bring it in line with the procedures outlined in UN R51-03 'Uniform Provisions Concerning the Approval of Motor Vehicles Having a Least Four Wheels with Regard to their Sound Emissions' up to amendment no. 6. In view of the growing noise pollution, it has necessitated the Government to lay down limits for different categories of vehicles in *Central Motor Vehicle Rules* (CMVR). Hence, the limits are not specified in this standard.

This standard specifies a test method for measuring the noise emitted by stationary road vehicles in use, the noise being measured in proximity to the exhaust and also the noise made near the engine.

The method is intended to check vehicles in service, and also to determine variations in the noise emitted by different parts of the vehicle under test, which can result from the:

- a) wear or abnormal working or modification of certain components, when the defect does not appear by visual inspection; and
- b) partial or complete removal of devices reducing the emission of certain noises.

These variations shall be determined by comparing the roadside measurements with reference measurements made under similar conditions, for example, during the type approval.

The values obtained by this method are not representative of the total noise emitted by the vehicles in motion. These should not be used to make comparison between the total noise emitted by different vehicles.

The composition of the committee responsible for preparation of this standard is given in Annex A.

In reporting the result of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 'Rules for rounding off numerical values (second revision)'.

Indian Standard

AUTOMOTIVE VEHICLES — NOISE EMITTED BY STATIONARY VEHICLES — METHOD OF MEASUREMENT

(Second Revision)

1 SCOPE

This standard specifies method for measuring the noise produced by a stationary road vehicles of L1, L2, L5, L7, M and N category as defined in IS 14272.

2 REFERENCES

The following standards contain provisions which through reference in this text, constitute provision of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

<i>IS No.</i>	<i>Title</i>
3028 (Part 1) : 2018	Automotive vehicles — Noise emitted by moving vehicles — Specification and method of measurement: Part 2 M and N category
3028 (Part 2) : 2022	Automotive vehicles — Noise emitted by moving vehicles — Specification and method of measurement: Part 3 L5 category vehicles
3028 (Part 3) : 2018	Automotive vehicles — Noise emitted by moving vehicles — Specification and method of measurement: Part 3 L5 category vehicles
14272 : 2011	Automotive vehicles — Types — Terminology

3 TERMINOLOGY

For the purpose of this standard, definitions of terms given in IS 3028 (Part 1), (Part 2) and (Part 3) shall apply.

4 TECHNICAL CHARACTERISTICS OF THE VEHICLE

4.1 Technical characteristics of the vehicle as relevant to noise performance, shall be declared by vehicle

manufacturer and shall contain at least the details given in Annex A to IS 3028 (Part 1), IS 3028 (Part 2) and IS 3028 (Part 3).

NOTE — If the specifications submitted for complete type approval of a vehicle contain the details specified in **4.1** there is no necessity of submitting this information again.

4.2 Modifications/Changes in Technical Characteristics

In case, the test is conducted for verification of compliance to statutory requirement, every functional modification pertaining to technical characteristics of noise performance of vehicle declared in accordance with **4.1** shall be intimated to the testing agency. Testing agency may then consider, whether the vehicle with modifications complies with specified performance requirements or any further testing is required. For considering whether testing is required or not, guidelines given in Annex B of IS 3028 (Part 1), (Part 2) and (Part 3) shall be followed.

After successful compliance to the performance requirements, if needed, the earlier test results shall be validated for the modifications/changes also. These conditions are applicable irrespective of any change in commercial name of the model.

5 INSTRUMENTATION

5.1 Sound Level Meter

5.1.1 The sound level meter shall be of the precision type as described in IS 3028 (Part 1), IS 3028 (Part 2) and IS 3028 (Part 3).

5.1.2 The sound level meter shall be calibrated and adjusted according to the instrument manufacturer's instructions or with a standard sound source (for example, a pistonphone) at the beginning and at the end of each series of measurements.

5.1.3 If the errors of the sound level meter obtained from these calibrations change by more than 1 dB (A) during a series of measurements the test shall be considered invalid.

5.2 A revolution counter external to the vehicle shall be used, with an accuracy of not less than 3 percent for engine speed measurement.

6 TEST SITE REQUIREMENTS

6.1 Every open space considered as suitable test site shall be outdoors and shall consist of a level concrete, dense asphalt with no appreciable level of porosity or similar hard material flat surface, free from snow, grass, loose soil, ashes or other sound-absorbing material. It shall be in an open space free from large reflecting surfaces, such as parked vehicles, buildings, billboards, trees, shrubbery, parallel walls, people etc within 3 m radius from the microscope location and any point of the vehicle. The vehicle in particular shall be at a distance not less than 1 m from a pavement edge when the exhaust noise is measured.

6.2 In the case of L2 category vehicles an alternative to outside testing, a semi-anechoic chamber may be used. The semi-anechoic chamber shall fulfill the acoustical requirements given above. These requirements shall be met if the testing facility meets the 3 m distance criteria above and has a cut-off frequency below the lower of:

- One-third-octave band below the lowest fundamental frequency of the engine during test conditions; and
- 100 Hz.

6.3 With the exception of the observer and driver, no person whose presence influences the meter reading shall remain in the measurement area during the test.

7 AMBIENT NOISE AND WIND INTERFERENCE

7.1 The ambient noise (including the wind noise) at each measuring position shall be at least 10 dB (A) less than the levels measured during the test.

7.2 The measurements shall not be made in adverse weather conditions. Care shall be taken that gusts of wind do not distort the results of the measurements. It is recommended that tests should not be conducted, if the wind speed at microphone height exceeds 5 m/s.

8 TEST

8.1 Number of Measurements

8.1.1 At least three measurements shall be carried out at each measuring position. The measurements shall be considered valid if the range of three measurements made immediately one after the other is not greater than 2 dB (A). The arithmetic mean value given by these three measurements shall constitute the result shall be rounded off.

8.1.2 For vehicles equipped with, exhaust outlets, where sound measurements are made at more than one location, the reported sound pressure level shall be for the outlet having the highest average sound pressure level.

8.1.3 For vehicles equipped with multi-mode exhaust system and a manual exhaust mode control, the reported sound pressure level shall be for the mode having the highest average sound pressure level.

8.2 Positioning and Preparation of the Vehicle

8.2.1 The vehicle shall be located in the centre part of the test area.

8.2.2 In case of vehicles other than two wheelers, the vehicle transmission shall be in neutral position and the clutch engaged, or in parking position for automatic transmission, and the parking brake applied for safety, if equipped. If the design of the vehicle does not allow this, the vehicle shall be tested in conformity with the manufacturer's prescriptions for stationary engine testing.

8.2.3 In case of a two-wheeled motor-driven vehicle having no neutral gear position, measurements shall be carried out with the rear wheel raised off the ground so that it is possible for the wheel to rotate freely.

NOTE — For better consistency two wheeled motor-driven vehicles are to be tested with vehicle on neutral position and without vehicle on centre stand.

8.2.4 The engine hood or compartment cover, if so fitted, shall be closed.

8.3 Measurement of Noise in Proximity to the Exhaust (see Fig. 2 for L1, L2 Category, Fig. 3 for L5 Category and Fig. 4 for L7, M, N Category)

8.3.1 Microphone Position

8.3.1.1 The height of the microphone above the ground shall be equal to that of the outlet pipe of the exhaust gases, subject to a minimum value of 0.2 m.

8.3.1.2 The microphone shall be pointed towards the orifice of the gas flow and located at a distance of 0.5 ± 0.01 m from the orifice.

8.3.1.3 Unless otherwise indicated by the manufacturer of the sound level meter, its axis of maximum sensitivity shall be parallel to the ground and shall make an angle of $45^\circ \pm 5^\circ$ with the vertical plane containing the direction of the gas flow on both sides.

If the flow axis of the exhaust outlet pipe is at $90^\circ \pm 5^\circ$ to the vehicle longitudinal centerline, the microphone shall be located at the point that is farthest from the engine.

The reference point as shown in Fig. 1 shall be the highest point satisfying the following conditions:

- The reference point shall be at the end of the exhaust pipe; and
- The reference point shall be on the vertical plane containing the exhaust outlet centre and the flow axis of the exhaust pipe termination.

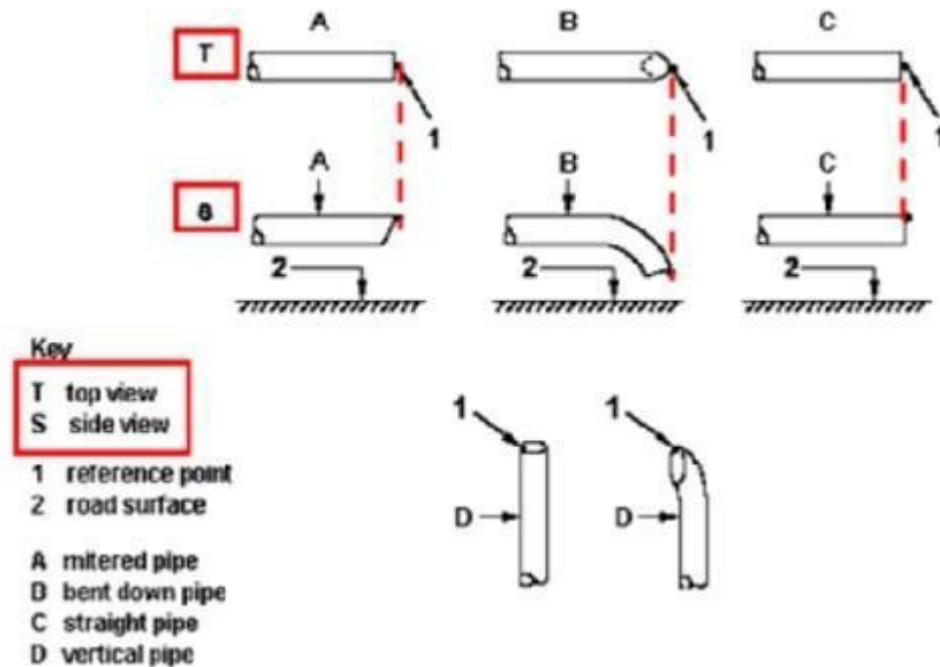


FIG.1 LOCATION OF REFERENCE POINT

8.3.1.4 In relation to this plane, the microphone shall be placed towards the external side of the vehicle, as shown in Fig. 2 for L1 and L2 category, Fig. 3 for L5 category, Fig. 4 for L7, M, N category of vehicles.

8.3.1.5 In the case of a vehicle provided with two or more exhaust outlets spaced less than 0.3 m apart and connected to a single silencer, only one measurement shall be made, the microphone position shall be related to outlet the farthest from the vehicle's longitudinal centerline or, when such outlet does not exist, to the outlet which is the highest above the ground.

8.3.1.6 For vehicles with a vertical exhaust, the microphone shall be placed at the height of the exhaust outlet, oriented upwards and with its axis vertical. It shall be placed at a distance of 0.5 m from the side of the vehicle nearest to the exhaust.

8.3.1.7 For exhaust outlets located under the vehicle body, the microphone shall be located a minimum of 0.2 m from the nearest part of the vehicle, at a point closest to, but not less than 0.5 m from the exhaust pipe reference point, and at a height of 0.2 m above the ground, and not in line with the exhaust flow.

NOTE — The angularity requirement in 8.3.1.3 may not be met in some cases.

8.3.1.8 For vehicles provided with exhaust outlets spaced at or more than 0.3 m apart, one measurement shall be made for each outlet as if it were the only one, and the highest level shall be noted.

8.3.1.9 When the vehicle design is such that the microphone can not be placed according to Fig. 1, because of the presence of obstacles being part of the vehicle (for example, spare wheel, oil tank, battery etc), a figure clearly showing the place chosen for the microphone used for measurement shall be included in the test report. As far as possible, the microphone shall be placed at a distance greater 50 cm from the nearest obstacle and its maximum sensitivity axis shall be oriented towards the exhaust gas orifice at a place which is the least marked/influenced by the above mentioned obstacles.

8.3.1.10 Multi-mode exhaust system

Vehicles equipped with a multiple mode, manually adjustable exhaust system shall be tested in all modes.

8.3.2 Engine Operating Conditions

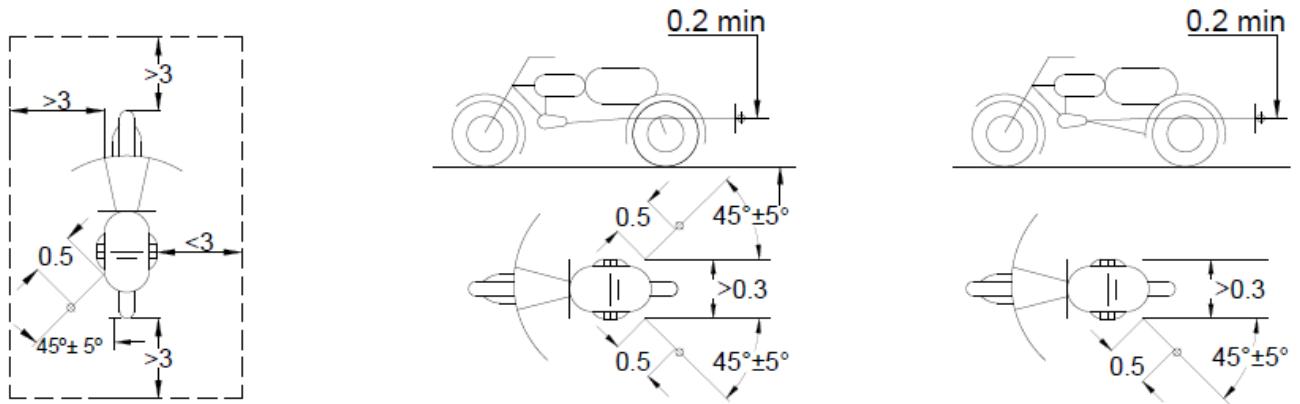
8.3.2.1 For L1 and L2 category of vehicles, the target engine speed is defined as:

- 50 percent of S for vehicles with $S > 5000$ rev/min; or
- 75 percent of S for vehicles with $S \leq 5000$ rev/min.

where

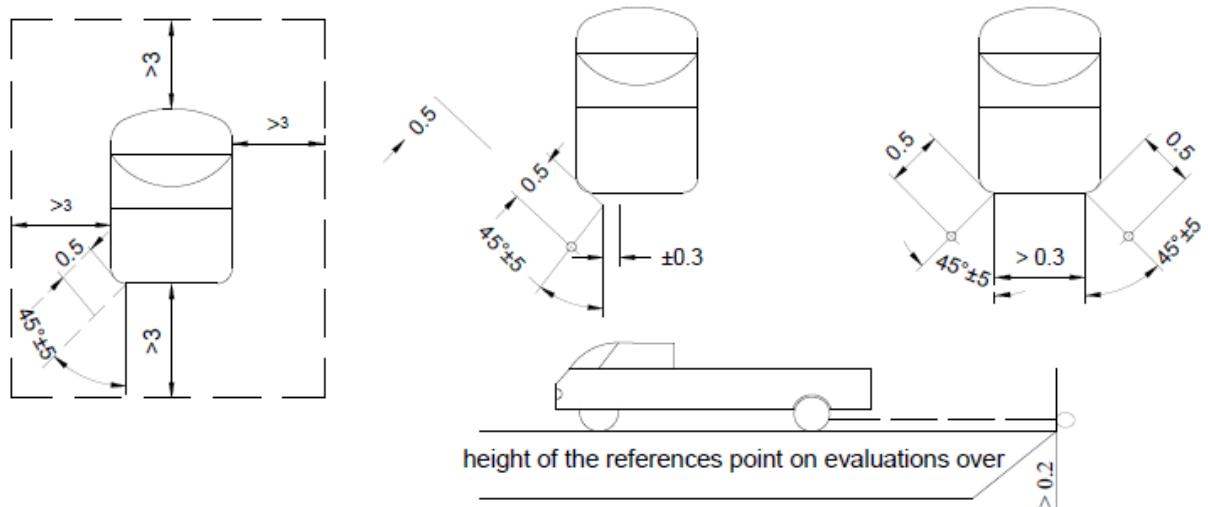
S is the rated engine speed.

NOTE — If a vehicle for which it is not possible to reach, in a stationary test, the target engine speed defined above, 95 percent of the maximum engine speed reachable in a stationary test shall be used instead as target engine speed.



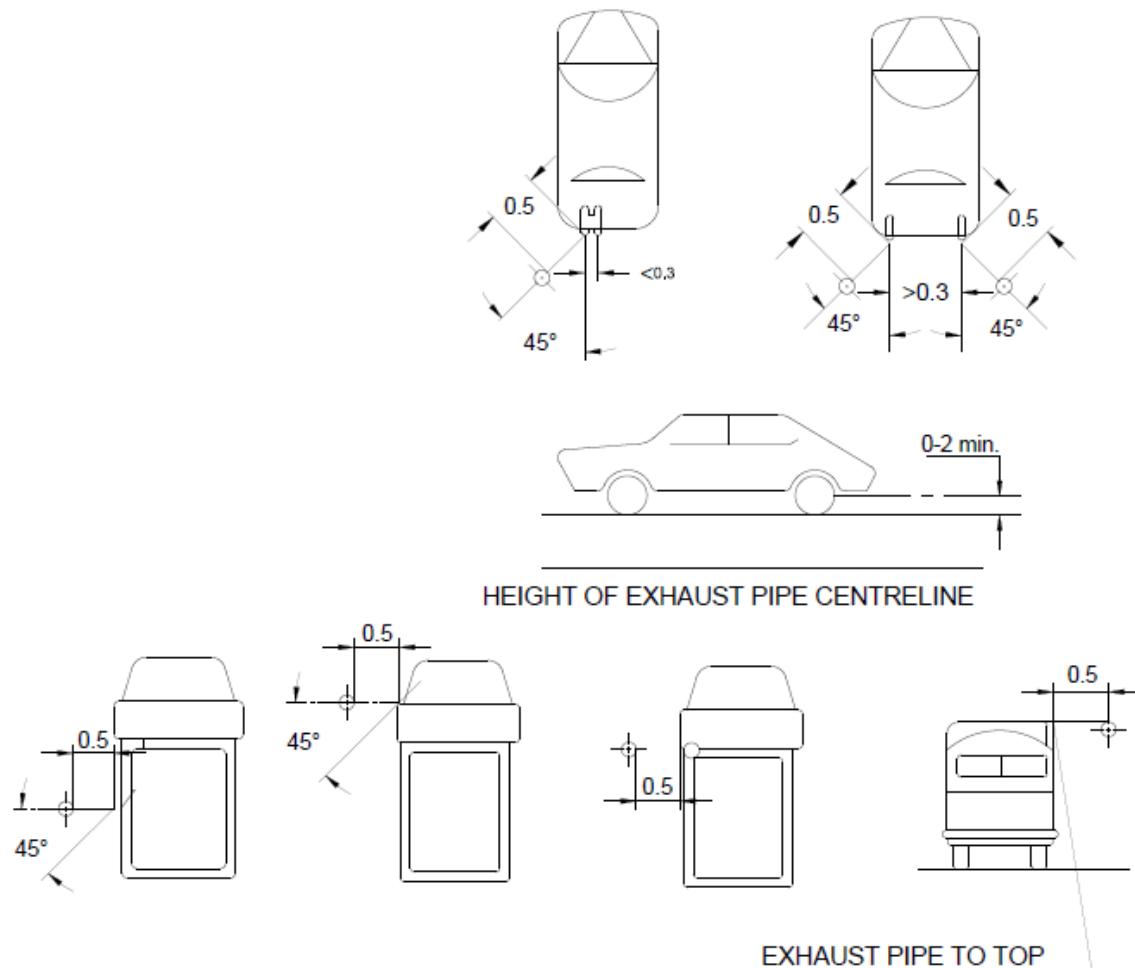
All dimensions in metres.

FIG. 2 TEST SITE AND MICROPHONE POSITION FOR MEASURING EXHAUST NOISE FOR L1 AND L2 CATEGORY OF VEHICLES



All dimensions in metres.

FIG. 3 TEST SITE AND MICROPHONE POSITION FOR MEASURING EXHAUST NOISE FOR L5 CATEGORY OF VEHICLES



All dimensions in metres.

FIG. 4 TEST SITE AND MICROPHONE POSITION FOR MEASURING EXHAUST NOISE FOR L7, M AND N CATEGORY OF VEHICLES

8.3.2.2 For L5 category of vehicles, the target engine speed is defined as:

- 50 percent of n_{rated} exceeds 5000 rev/min; or
- 75 percent of n_{rated} does not exceed 5000 rev/min.

where

n_{rated} = the rated engine speed.

NOTE — If a vehicle for which it is not possible to reach, in a stationary test, the target engine speed defined above, 95 percent of the maximum engine speed reachable in a stationary test shall be used instead as target engine speed.

8.3.2.3 For L7, M and N category of vehicles, the target engine speed is defined as:

- 50 percent of the engine speed S for vehicles with a rated engine speed ≥ 7500 rev/min;
- 3750 rev/min for vehicles with a rated engine speed above 5000 rev/min and below 7500 rev/min; or

- 75 per cent of the engine speed S for vehicles with a rated engine speed ≤ 5000 rev/min.

NOTE — If the vehicle for which it is not possible to reach the engine speed as stated above, the target engine speed shall be 5 percent below the maximum possible engine speed for that stationary test.

8.3.2.4 The engine speed shall be gradually increased from idle to the target engine speed and held constant within a tolerance band of ± 5 percent for L1, L2 and L5 category, ± 3 percent for L7, M and N category. Then the throttle control shall be rapidly released and the engine speed shall be returned to idle. The sound pressure level shall be measured during a period consisting of constant engine speed of at least 1 s and throughout the entire deceleration period. The maximum sound level meter reading during this period of operation, mathematically rounded to the first decimal place.

Measurement shall be regarded as valid only if the test engine speed did not deviate from the target engine speed by more than the specified tolerance of ± 5 percent for L1, L2 and L5 category, ± 3 percent for L7, M and N category for at least 1s.

Vehicles equipped with multiple mode, manually adjustable exhaust system shall be tested in all modes.

9 TEST REPORT

The test report shall contain the following information:

- a) A reference to this standard;
- b) The vehicle model/registration number type tested;
- c) The test site, ground conditions and weather conditions;

- d) The measurement instrumentation (including windscreen, if used);
- e) The location and orientation of the microphone;
- f) Engine operating speeds used for the tests;
- g) The A-weighted sound pressure levels determined by the tests;
- h) A-weighted sound pressure levels of the background noise at each measuring position;
- j) Any abnormal conditions; and
- k) Sketch referred in 8.3.1.9.

NOTE — In the case of a two wheeler having no neutral gear position, measurements carried out with vehicle on centre stand or without centre stand to be reported.

ANNEX A

(Foreword)

COMMITTEE COMPOSITION

Automotive Braking and Steering Systems, Vehicles Testing and
Performance Evaluation Sectional Committee, TED 04

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Amendments Issued Since Publication

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